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SOME ACCOUNT
OF AN
UNCOMMON APPEARANCE
IN THE
FLESH OF A SHEEP;
WITH REFLECTIONS ON
THE NUTRITION OF SHEEP, &c.

BY

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Agriculture and Medicine are Sister Sciences: that supplies Food, and this
Remedies.

CELSUS.

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PREFACE.



THE principal object of the following pages is to give, of a fact which appears to be somewhat singular, a statement, which is precise, perspicuous, and divested of all hypothetical expressions.

The Writer thought it would be a disgrace to him to have neglected the fact; and he was not the less disposed to inquire into it, because he could neither account for it, nor foresee any practical utility which was likely to result from it. But he did not presume to set bounds to the energies of others: he was not without the hope, that the Members of the Board of Agriculture might be able to trace the fact to the circumstances which furnished the occasion on which it occurred, and be thereby led to

make improvements in the care and nurture of sheep.

He had another inducement for recording the fact: his studies, as a Physician, had taught him, that the phenomena of health and of disease, are effects intimately connected with the organization of the body; and that the physiological metaphysics of Dr. Darwin and others, of which so much has of late been heard, rest on a total misapprehension of the extent of genuine science.

Lastly, he had felt a conviction, unceasing and every day increasing, that, if it is requisite and necessary for a Physician to be acquainted with the general laws, by which the connection between symptoms and the constitution, or state of the several organs and viscera of the human body is regulated, to have learned all such laws as resemble them in other living bodies, merits not so much the praise of diligence, as not to have attended to them deserves the charge of neglect.

It is easier and more natural to observe resemblances than differences: and even children, before they acquire the use of speech, are attentive to the analogy, constancy, and uniformity of physical events, and so learn their connexions as to foresee what will occur in the natural course of things.

The resemblance between plants and animals is sufficiently obvious; that between the more perfect animals and man is still more striking; and that between the individuals of the same species is so prominent and emphatic, that what is found out by observation and by experiment in only one individual, is admitted as full evidence of its existence in all the rest. Nay, the individual truths, which belong to such organs and viscera as are common to the human and to other species of animals, are truths of the same kind; and it is legitimate to rise by a cautious induction from truths of the same kind to general truths, the names of which being common to all the individuals compre-

hended under them, may be predicated of any single one.

Whatever some may have arrogated as modern, and others may have depreciated as obsolete, all seem at present to agree, that our notions, however various, arise mediately or immediately from the perceptions of sense; and that we could not extend our knowledge of nature beyond individual objects and individual events, without making terms common to classes of them, found out by observation of those qualities wherein they agree with one another. "To learn a science is to learn its language," is a proposition of which the subject and the predicate reciprocate with each other; and although the Abbé de Condillac would seem to claim this as his own discovery, it was as well taught by Aristotle more than three hundred and eighty-four years before Christ.

But to detain the Reader no longer, the organs and viscera of sheep are for the most part

exactly like those of man, not only in structure and destination, but also in the very atoms, into which they may be resolved by chemical analysis. And, if it be assumed, that they are formed after the same manner in sheep, as in man, it may be inferred that, when they are exposed to the same causes, under the same circumstances, they exhibit similar phenomena, and are therefore obnoxious to similar changes of organization.

Rochester, June, 1813.

N.B. The Mutton-Chop, which is more particularly the subject of the following pages, is deposited in the hands of the Publisher ; that Graziers and others, who are curious, may inspect it.

SOME ACCOUNT,

&c. &c.

IN December, 1812, as the Writer of the following pages was walking through Strood, he saw in a butcher's shop some mutton, which, as his mind was then unoccupied with other things, made a deep impression on it. Of a leg of mutton, those muscular or fleshy parts, in which the redness is commonly most intense, appeared to him to be white; and those in which the redness is commonly fainter, seemed to be of the most dilute pink. That his perception of such a phenomenon might be as correct as possible, and that his memory might retain it so, he attended to it for some time with no small curiosity; and he even scraped the parts which were the subjects of it, that thus confirming his observation by an experiment, however simple, he might be the better enabled to form an accurate judgment of the change they had undergone.

He would have made many inquiries concern-

ing this mutton, if the butcher had been at home. But not suspecting that its appearance could recommend it to the most ignorant as a delicacy, he resolved to come again after a few hours, hoping he might then meet with the butcher. Far be it from him to insinuate, that he considered this mutton, which was exposed to sale, as noxious : he did but think that, in proportion as it was deprived of *fibrin*, it was the less nutrient ; and that, in proportion as it was converted into fat, it was the more difficult of digestion.

As he was returning to Rochester, he endeavoured to recollect, not only every thing that he had ever seen or heard of, respecting the changes to which the muscles of quadrupeds are liable, but also every thing of which he had ever read in the writings of pathologists. Besides, he told every acquaintance who came in his way, what he had been examining with so much wonder, that he might induce others to become witnesses of it. But he was particularly anxious to fix on some principle which might direct his inquiries, when he should return to Strood.

He never thought of purchasing any of the mutton ; for although its appearance was novel to him, he did not know that it was so to those

engaged in agricultural pursuits. From this omission, however, he had nearly lost for ever the advantage which he now enjoys, of possessing a part of the mutton; but while he was sitting in the midst of his family, and relating what he had seen, he received a present of chops, cut from the very mutton he was describing.

The reader may easily conceive how grateful it was to him to have an opportunity of subjecting the mutton to such an examination at his own home as, imperfect as it must be, could not be undertaken in a less appropriate place; and how earnestly he availed himself of it without delay. But it came into his mind that, as the friend who had sent him the chops was engaged in the breeding of sheep, he was the proper person to make the inquiries which were to have been made by himself: nor did it escape him, that the suspicions which such inquiries are apt to kindle, might challenge all this gentleman's address; and that even more occasions than one might possibly be deemed necessary for him to elicit such full and correct information as was required.

The little that the Writer has been able to ascertain, concerning the mutton, he purposes to communicate under the two distinct heads of

1. Observations and Experiments ; and of,
2. Inquiries.

But as each of these heads will be consecrated to real objects and to real occurrences, the reflections which they may suggest to one who has from his earliest years been taught to look to principles for guidance in possible cases, shall be set apart under a third head.

I. *Observations and Experiments.*

The reader to whom the ordinary appearance of the muscles of sheep, at the different periods of growth, is familiar, may be content with knowing, that the chop taken from the loins (for the Writer had another from the neck) is in no place like flesh, which is fibrous, soft, flaccid, and red, from blood partly in combination with the proper matter of muscle, and partly free, but contained in arteries and veins ; that it nowhere exhibits *striae*, which can be conceived to be the remains of blood vessels ; and, in short, that where the muscular structure is to be looked for, there is a substance resembling in colour, in texture, and in consistence, the fat usually found about the kidneys. This description, short and imperfect as it is,

since it points out the particulars most worthy of notice, may, it is presumed, convey a clearer and a more precise idea of the subject of this paper, than can be done by a representation, if this were ever so skilfully made.

Such a reader may also be pleased to know, that the parts of this chop which should be muscular, are not in the least degree diminished; and that the fat of the sheep, where fat is usually found, showed nothing remarkable.

Nor may it be amiss to state farther, that the change described was particularly obvious in the muscles of loco-motion; that it was most perfect in such of these as were most frequently and most forcibly put in action; and that it seemed to have begun in those most distant from the heart. But the chop that is preserved, shows clearly that the change extended to the tendons, to the ligaments, and even to the cartilages of the bones; for in it the bone lies in close contact with the substance resembling fat.

1. As the muscles so changed, were at first viewed by a compound microscope of considerable power, many of the conceptions of physiologists, respecting the ultimate fibres of muscles, crowded into the mind. On a more minute

inspection, however, no vestige of fibre could be discerned, but only minute particles, the figure of which it was impossible to ascertain.

2. After the two mutton chops had been hung up a fortnight in a larder, their smell was as sweet as ever: the substance that supplied the places of the muscles, had only lost its brightness, and become somewhat drier.

Of the cervical chop, some of the muscles were not so much altered as those of the lumbar; they were of a pale red, and were fibrous; streaks of fat being interposed between the fibres, which, however, was of a firmer consistence than the fat so placed usually is in the mutton sold at the Leicester market.

3. The muscles entirely changed, were neither friable, nor crystalline, nor lamellated, like *spermaceti*.

It might have been concluded that they were changed into the *matière adipo-cireuse* of Fourcroy, if the Writer had not known that their change took place in the life-time of the sheep; not, however, that he held, as some do, that the formation of *adipocire* pre-supposes a total separation of the vital principle; but that he could not recollect any instance of the formation of this substance in a living animal. It

certainly did not resemble new cheese, nor wax, nor an ammoniacal soap. But of this more hereafter.

4. Writing-paper pressed upon it, was rendered greasy and impervious to water; and the greasiness was not volatilized by a degree of heat equal to that at which water boils.

5. Plunged into water, while it was boiling, the substance manifested no contraction or increase of density; and when boiled in the water for some minutes, no albuminous scum rose to its surface.

6. Cut into pieces, separated as much as possible from any thing like membrane, and melted with water till this was entirely evaporated, the substance was rendered whiter and freer from both the smell and the taste of mutton.

7. Prepared in this manner (6), and melted slowly, Fahrenheit's thermometer immersed in it, as soon as a pellicle appeared on its surface, rose to 107° , and sunk to 100° as soon as it was all congealed. Its combustion was like that of hard suet, but more noisy.

8. It was insoluble in alcohol, and in ether.

9. Some bits of it dropped into sulphuric acid were first turned of a yellow brown, and then dissolved; sulphurous acid being at the same time disengaged. When the solution was

heated, it became of a much deeper brown, and a portion of it, quite black, concreted and floated on the surface.

The mixture being poured into cold water, the fluid part of it afforded a white flocculent precipitate, which seemed to be fat; and the concreted part, which continued black, was found to be a true acid soap.

10. Nitric acid had little or no action on this substance (6); but poured into it when melted, in the proportion of one-sixteenth of the acid, and blended well with it, the mixture became of a light straw colour, and of the consistence of an ointment.

11. Boiled in a solution of soda, the mixture became opaque; and on standing for some time, a soap was formed on its surface.

12. Decomposed by heat, it yielded water, an acid of an acetic or benzöic odour, and a thin oil.

13. The gasses collected in this experiment (12), were shaken in a mixture of lime and water, of the consistence of cream, when a considerable portion was absorbed; and the unabsorbed portion, when inflamed, burned for a considerable time with a thick blue flame.

In no part of the examination of this substance was any trace of ammonia discovered.

From the preceding observations, and the experiments, which, from the want of a proper apparatus, cannot be considered as very accurately made, it may perhaps be concluded,

First, that not only the fibrin of the muscles was removed, but also the organization destined for its formation, or for its reception ;

Secondly, that the fat of the sheep had not in the least degree undergone such a change as that which, it should seem, began in the muscles, and extended from them to their appendages ; and,

Thirdly, that the substance supplying the places of the muscles, consisted of only carbon, oxygen, and hydrogen ; the carbon being perhaps in a larger proportion than in common fat.

II. *Inquiries.*

1. Was the sheep an ewe or a wether?—A wether.

2. What was its age?—Two years.

3. Where had it been bred?—In Romney-marsh.

4. What had been its food?—Never any thing but grass.

5. Was it as large as the other sheep of the

same age, with which it had been bred?—Yes; but it was so weak, especially in its hind quarters, as frequently to fall down.

6. Did its weakness follow castration (drawing)?—No.

7. Was there any thing peculiar in its wool?—No.

8. Had it ever laboured under any disease?—Never: its tottering and falling had not been remarked more than a fortnight before it was killed; and it was killed for no other reason than that its weakness increased daily.

9. Were any of its bones luxated?—No.

10. Was the fat of its mesentery (caul), kidneys, &c. found in the usual quantity?—No: it was very deficient.

11. Was its internal fat found of the naturally healthy appearance?—Yes.

12. Was its marrow found of the naturally healthy appearance?—Yes.

13. Did its blood, when effused, coagulate?—Yes.

14. Had its fæces had the usual appearance?—Yes.

15. Was its liver found sound and of the usual appearance?—Yes.

16. Was any thing remarkable observed in its heart or its lungs?—No.

These inquiries were made as quickly as possible, that they might be satisfied, not only before the mutton was entirely disposed of at the butcher's shop, but also before any circumstance of the sheep was in any degree forgotten. They were, therefore, made on the spur of the occasion ; and are such as the Writer believes any professional man might have made. But whether other inquiries of greater importance might not have been expected of himself, as it is now too late for him to consider, the humanity and judgment of the reader must determine.

But whatever may be thought of the Writer's inquiries, all who are qualified to appreciate his motives, will allow, that the answers given by Mr. T. E. Hulkes are precise and perspicuous ; a proof, if any were wanting, of the lively interest this gentleman feels in every thing relating to an animal which contributes, in so pre-eminent a degree, to the necessities and to the accommodations, to the diversions, and even to the luxuries of man.

III. *Reflections on the Phenomenon in the Sheep; on the Nutrition of Sheep; and on different Subjects arising one from another.*

The elements or atoms composing a living body, are perpetually changed: such as are added to it, and as concur at any time to constitute any part of it what it is, are, when they become noxious, removed to make room for others. The elements are more frequently changed in some animals than in others; and they are most frequently changed in those individuals which are most active. Nobody supposes, that his personal identity consists in the sameness of his body or matter.

There are in man, and in hot-blooded animals, three parts, the intestines, the lungs, and the skins, to which the elements composing them are presented, either in mixture or in composition. And it is so ordained, that at one or more of these three parts, those elements are never entirely wanting. Of all the elements, those which are most indispensably necessary to the formation of animal matter, are perhaps presented at the lungs, as well as at the intestines: and when they are not offered by the latter, they are taken up more abundantly

from the former. Azot, which has so long been considered as an element, is found in the organs of animals which feed on substances that do not contain it.

The whole body of the embryo should seem to consist at first of mere *albumen*, which is formed of atoms of *azot*, with atoms of *carbon*, of *oxygen*, and of *hydrogen*, united in definite proportions; and *albumen* should seem to be afterwards changed into all the soft parts of an animal. The convertibility of all the soft parts of animals into *adipocire*, shows further their affinity one with another, as to the elements of which they are composed. And the analogy in appearance and in composition between animal fat, expressed oil of vegetables, *spérmaceti*, *adipocire*, *biliary calculi* of a lamellated structure, the contents of *steatomatous* tumours, &c. might suggest, that, if an animal could be made to subsist on food, which neither directly nor indirectly supplies *azot*, in an atmosphere consisting of only *carbonic acid* and *oxygen gas*, it would in time be turned into a sort of vegetable. To say nothing of the *phœnix dactylifera*, *croton sebiferum*, &c. it were to be wished that the sheep killed at Strood had been preserved alive.

The reader, having seen Fourcroy's account

of the change which the dead bodies had undergone in the *Cimetiere des Innocens* at Paris, may wish to know, whether a similar change may not take place in living animals. This much is, however, certain, that the *adipocire* of dead animals bears but a remote resemblance to any thing yet discovered in living animals. Besides, *adipocire* is first formed of the fat; whereas the change in the sheep at Strood began in its muscles. As, however, the physical power may in some organs occasionally predominate over the vital, who can tell what effects of the former may not appear? But of this still more hereafter.

Nothing is yet ascertained concerning the formation of the proximate principles of one living body out of the atoms of another; except that animals derive their atoms from other animals and from vegetables, which have died; and that vegetables derive their atoms from other vegetables, and from animals which have died.

Nature supplies not elements to be compounded by us, but concretes to be decomposed: organized bodies in particular are very complex. The anatomist may scrupulously divide and inquisitively explore the organization of any structure, as far as the sphere

of his vision extends ; and he may then call in the aid of the microscope to magnify such as are too subtile and fine for his senses ; but here his labour ends. The chemist may resolve any part into its *albumen*, *fibrin*, &c. and he may then reduce these principles into others more simple ; but here his labour ends. All the art of man cannot so combine physical atoms as to form a blade of grass, much less to realise the fable of Prometheus. He who would know any thing in nature, must analyse it: he who would communicate what he knows, must analyse it again, to show how he knew it. Learning, teaching, and convincing, are analytical processes. Infants are led by their wants to analyse, before they can speak ; and peasants analyse, although they employ words unappropriated and undefined. Analysis is in principle the same, though its object be ever so different.

The reflexions which follow, were reserved for this place, because, although not altogether heterogeneous to the subject, they could not be intruded with any gloss into the two preceding sections.

Of all the different structures in an animal, the muscular is the least liable to change : it is one of those which are never regenerated, as

bone and nerve are ; which are never, as bone, cartilage, and fat are, found where they are not placed originally by the hand of Nature, &c. Muscles may, nevertheless, be diminished, enlarged, removed, contracted into a ligamentous and semi-transparent substance, turned opaque, reduced to a mere parenchyma, or converted in part into a matter like bone ; but of their places being, during the life of an animal, filled exactly and almost exclusively with fat, this is perhaps the first example on record.

The diseases of sheep are thus classed :

“ Diseases attended with Fever.

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| 1. Sickness, | 3. Leaping-evil, |
| 2. Braxy, | 4. Inflammation of the lungs. |

Diseases attended with a Vitiated Habit.

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|--------------|---------------|
| 1. Rot, | 5. Sturdy, |
| 2. Leg-evil, | 6. Staggers, |
| 3. Dropsy, | 7. Red-water, |
| 4. Jaundice, | 8. Wild-fire. |

Local Diseases.

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|---------------|-----------------------|
| 1. Purging, | 5. Cramp of the legs, |
| 2. Blindness, | 6. Tail-evil, or tag, |
| 3. Scab, | 7. Foot-rot.” |
| 4. Maggots, | |

Now to which of these genera is the change

in the Strood sheep to be referred? Is it a species or a variety of rot?

“ In the rot,” says Mr. Stevenson, “ the lungs are the principal seat of the affection, and on opening the body, they are sometimes found almost destroyed.”

Again: “ The mutton of rotten sheep does not stiffen when cold, but remains flaccid, and when boiled, dissolves away to mere membrane, and has a weak, watery, and insipid taste: the muscular fibres are pale and wasted, but the fat seemingly remains. It however appears dry, dead white, and brittle, or shining with water, and in its nature is completely altered; for it does not melt or inflame like an unctuous substance, but when thrown on the fire, crackles and blackens to a cinder. Very little blood is found in the animal, and it is pale and thin, resembling water tinged with blood, rather than blood. The bones are remarkably brittle.”

It is not certain, that such a change as that described in the Strood sheep, ever occurs in man. Haller refers to Saltzman, who saw muscles so fat, that their fibres could not be distinguished: but he does not say expressly, that the muscles were human, or even that they were examined with a magnifying glass. And, indeed, the little

he produces on the subject, is too vague and unsatisfactory to be made a ground of reasoning.

Bichât says, “ La graisse surabonde quelquefois dans ce tissu, au point que les fibres charnues étouffées par elle pour ainsi dire, disparaissent et la laissent voir uniquement; mais souvent aussi on prend pour cet état graisseux des muscles, l’aspect jaunâtre de leurs fibres, aspect produit par l’absence de substance colorante. Je n’ai vu le premier état que rarement; le second est extrêmement fréquent; on s’y méprendroit quelquefois au premier coup d’œil. Mais l’ébullition et la combustion prouvent facilement que la graisse est absolument étrangère à cette décoloration des muscles examinés dans cet état.” But if the fleshy fibres be *smothered* with fat, the fleshy fibres must exist: and that this is not a forced construction, but the genuine sense of Bichât’s words, is plain from another place in the same volume, where he declares that, “ Parmi le grand nombre de sujets que j’ai eu occasion de disséquer ou de faire disséquer, je ne me rapelle point avoir vu dans les muscles de la vie animale d’autres alterations qu’ecelles de leur cohésion, de leur densité, de leur couleur. C’est un phénomène que les rapproche de ceux de la vie organique où l’on ren-

contre rarement des changemens de tissu, comme le cœur, l'estomac, &c. en offrent des exemples."

Whatever the disease of the Strood sheep may have been, it cannot be referred to the order *Intumescentie* of Sauvage or of Cullen; for there was no enlargement of the body or of any part. There was no symptom of the disease called *Polysarcia*, i. e. *excessive fatness, obesity*, &c. Sauvage renders this word *corpulence*. No mention is made of the disease by Pinnel. The common French expression for it is *fausse graisse*.

The animal's heart and lungs shewed no peculiarity: but if its *foramen ovale* had been not closed, this had not prevented its blood from being duly changed by respiration.

Things which suddenly debilitate, are said to give occasion to the rot; but this sheep had always had good food, a secure shelter, and kind treatment.

The places of its muscles were filled with a substance, which did not yield all the elements which muscles do. Can it be supposed, that the sheep had received in excess those elements which predominate in fat? Had *oxygen* been abstracted, it had indeed been not unreasonable to conclude, that its fat would have been

in excess; but then, that it would have been so in the adipose membrane, and not in the *parenchyma* of its muscles. When more food is presented to the lacteals than the system of an animal calls for, the lacteals let it pass on in the intestines. The call of the system gives the lacteals their stimulus; and that call being answered, they rest from their labour till it calls again. But to adduce another proof no less striking—if a person sitting still, respire ever so frequently, his blood is not the more decarbonated. Yet, if he accelerate the circulation of his blood, and thus occasion a desire of more *oxygen*, then he breathes more frequently, that more *oxygen* may pass into his lungs. It should therefore seem, that the system of an animal does not take up more nourishing matter, because more is offered to it; and that its taking up more *azot*, more *carbon*, more *oxygen*, or more *hydrogen*, at any one time than at any other, presupposes that the other elements have been already taken up. But it cannot be doubted, that the state of the vital power being altered, the action of the organization must likewise be altered; and that, to this double alteration, there may be a consequent admission of more of one sort of elements into the system, and even new arrangements and com-

binations of the elements already admitted. But the change of the action of the organization must be antecedent to the admission of more of one kind of elements than of another ; therefore the admission of such elements can never be the principle of any disease. To give an example: Dr. Rollo maintains, that the phenomena of diabetes originate in a hyperoxygenated state of the system. But his assumption of this fact is not fairly and clearly shown to grow, if this expression may be used, out of the facts for which it was to account. The assumption of a hyperoxygenated state of the system, to explain the phenomena of diabetes, is a hypothesis as absurd as that of Vortexes, to explain the motions of the heavenly bodies. The notion of diabetes, which is perhaps a very complex one, has not yet been analysed. This disease should seem to belong to the *MARCORES* in Cullen's arrangement, which was first remarked by Dr. Lubbock, of Norwich. The name *diabetes* is the specific difference: the evacuated urine exceeds the quantity of liquor which is drunk. From this, as a principle, all the symptoms flow. *Mellitus* and *Insidus* distinguish not species, but varieties. Considering that emaciation then is the most constant and palpable feature of diabetes, it should seem that it con-

sists in a diseased action of those powers, on which nourishment and growth depend; and that the formation of sugar in it is a process purely chemical. That the diseased action is prior to the formation of the sugar, and does but furnish the occasion of its formation, the Writer entertains no doubt: he does not believe, however, that sugar ever produces a temporary diabetes, although he can conceive that it, like gum, and several other substances, may sometimes pass unchanged to the bladder. It has been asserted, that the cure of diabetes is most successful, when sugar and the elements, of which it consists, are withholden; and when matters, such as sulphurets, hydrosulphurets, and phosphorets, which convert sugar into gum, or something like it, are administered. If it be so, the Writer thinks the inference, that sugar and substances affording its elements are positively noxious, an unfair inference: he would only say, that they are unfit for assimilation in this disease. He does not admit, that a vital action is ever the efficient cause of sugar, because it may be made by decarbonating starch to a certain degree with diluted sulphuric acid; nor that the stomach and bowels are ever the laboratory in which sugar is made, since the serum of the blood of diabetic patients contains

none of it. Yet no person can doubt, that, when a man is hungry, his lacteals may take up that, in which there is a deficiency of some one of the elements of his body; and that, if any one of its elements, *azot* for example, be withdrawn, those parts into which *fibrin* enters as a proximate principle, may cease to be formed.

Tea and coffee-drinkers often have their digestion entirely suspended; dram-drinkers always in some degree: and then the greater part of the food passing through their bowels either unchanged or else in a state of fermentation, an acid is formed, which occasions heart-burn and sour eructations; and gasses are set loose, which, by distending the stomach, disturb the functions, not of the abdominal viscera only, but of the thoracic likewise.

The Writer has long been obliged to refuse coffee after dinner, from the acidity which almost immediately follows the taking of it, and from the pervigilium which he experiences from it. Every one knows how suddenly the symptoms of indigestion follow those passions which are called depressing. But where there is already indigestion, the absorption of undigested matters, by the lacteals, increases it. It is increased then by swallowing food not enough masticated,

and also by drinking too largely at meals. The emaciation, with pain of the stomach after meals, and with stools containing undigested food, a disease very common among children who are beginning to eat meat, may possibly be attributed to these two circumstances: in the former, the surface of the food is not dissolved before its inner part runs into fermentation; in the latter, the gastric liquor is diluted, and so rendered less solvent. In confirmation of this, it may be remarked, that frogs and carnivorous animals, which seldom drink, and drink very little at a time, digest their food most rapidly. Now, in all the instances above-mentioned, chyle is formed in too small a quantity to satisfy the call of the system for nourishment; and it is blended with unassimilated food, and thereby rendered noxious. Noxious, however, as it is, if it be taken up for want of what is wholesome, it is carried into the blood; and the pervigilium occasioned by coffee, depends, perhaps, not on the coffee, but on unassimilated food. Are not many of the eruptions of children owing to the same cause, Nature exterminating what is adventitious by the exhalants? Who then can wonder, that those who destroy the appetite for food by sensual and voluptuous living, should become languid, pinguid,

arthritic, vertiginous, apoplectic, icteric, &c. or *nervous*, feeble, emaciated, phthisical, &c.? It is a matter of painful regret, that those who are most addicted to intemperance, are they, in whose productive powers, together with those of the land, consists the true wealth of a nation.

The reader will not imagine, that in fermentation, is here comprehended putrefaction. Putrefaction never occurs in the stomach and bowels; the bile prevents it. But putrefaction never happens, although no bile flow into the intestines: the *fæces* never have the odour of putrid flesh; there must, therefore, be some other antiseptic provided by Nature in such an emergency.

Is *fibrin* then, already formed, derived from the blood, or is it formed in the muscles themselves? It abounds in the blood, and it is generally supposed to be the characteristic of muscle. But it is always present in muscle, unless the crystalline lens be a muscle; whereas it is sometimes totally wanting in the blood. Perhaps the *fibrin* of blood, which is not derived, *quasi fibrin*, from the chyle, is in a state ready to be converted into the *fibrin* of muscle. This is not improbable; for the arteries entering the muscles at their circumference, send into them *fibrin* dissolved in *serum*; but for the *fibrin* to

be separated and assimilated to the muscles, presupposes some change in it ; and for a muscle to obey the mandates of the will, perhaps presupposes a succession of changes.

Assuming, therefore, that the *fibrin* of muscles is formed in the muscles themselves, it should follow, that the cause of the change in the muscles of the Strood sheep is not to be sought after in its food, but in its muscles. Nor is the assumption gratuitous ; for its blood did coagulate, and therefore had not ceased to send *fibrin* to its muscles. Besides, if the blood of the fetus contain no *fibrin*, who knows that the very formation of this principle does not depend on that power of the *sensorium*, which is not called into action till birth, and which is not exerted then, until blood sufficiently oxygenated in the lungs, have been carried to the brain ? If *fibrin* be the discriminating characteristic of muscle, it may be in only its nascent state that the spark of animal life, imparted by the mother, is first kindled in it.

To expatiate largely on that life, which succeeds the life of the fetus, were a work of supererogation. Those who may wish to ruminate on what the sages of antiquity have bequeathed, concerning the mind of man acting by an instrument necessarily, and concerning the mind

presiding in the world, acting by an instrument freely, may find it all fairly and plainly stated in the works of some modern metaphysicians, which are very properly established among the Classics. It would be soaring too high to do more than allude to a subject, on which those who have abstracted most correctly, and generalized most chastely, have never agreed. But as the Writer may not have another opportunity, he cannot forego the present, to notice some hypotheses, which are supported by such a semblance of proof, and by such a degree of earnestness, as may lead those, whom authority leads, to consider them as true. Thus Dr. Denman in England, and Professor Bichât in France, have published opinions respecting the change of fetal for infantile life, to which it may not be impertinent to call the attention of the speculative reader.

The former, explaining the birth of a child, says, its “cry, which does not seem to be occasioned by pain, but surprise, is in its consequences extremely important, as it is the cause of an exertion of all the powers of the child, and enables it to acquire a new manner of living, inconsistent with, and very different from that which it possessed before it was born.” An objection of great cogency to this is, that

surprise presupposes not only sensation, but also thought.

Bichât's opinion is somewhat like Haller's; his words are, "*on peut dire à cet égard que ce moment est aussi pénible pour l'enfant que pour la mère.*" This is monstrous: pain is a complex notion, it implies a sensation, of which the mind is the subject, but which has no object; and it implies a perception, of which the mind also is the subject, but which has an object. Now sensations arise from the impressions of external bodies on our organs of sense: therefore, the fetus, on whose organs of sense external bodies make no impressions, can have no sensations. But if no sensations, then no thought, no desire, no volition.

Screaming and writhing of the body are, in those who have for some time breathed, associated with the feeling of pain, because experience has taught them, that pain is relieved by such exertions; but the fetus, in which the intercostal muscles and diaphragm have not yet contracted, has no experience. The belief, therefore, is not consentaneous to reason, that crying and writhing of the body are signs of pain at birth.

The Writer does not think that the child is sentient, as man is, till it has breathed; but

he does not doubt that it has previously susceptibilities and correspondent impressions, as a vegetable has; and that, on its having them, its nutrition and growth depend.

The motions of the fetus, of which the mother becomes sensible, about the middle of gestation, are by some physiologists supposed to be like those, which the passions excite after birth in the voluntary muscles; or which indigestion occasions in one, who is asleep, and whose muscles, it happens, are not then influenced by the will. Authors do not agree concerning the cause of the motions of the fetus; and many reasons might be adduced to show, that these motions are totally independent of the brain. Thus acephalous and hydrocephalous fetus, which cannot live out of the uterus, are often violently moved in it. Where is the central organ in these to receive the supposed impressions, or to bear a part in any sympathetic movement?

All the motions at birth should seem to be effects of instinct. The chick, which bursts from its shell, runs immediately to pick up food, but it cannot be led to do so by the experience of pain for want of food. The sensation of appetite is possibly elicited by food; but the desire of food is consequent to the sensation. It

is common to represent all appetites as painful, and hunger is no doubt painful. But the appetite for food in a moderate degree, is no more painful than the appetite for fame; nay, it is often, like it, pleasurable. Is it not more natural then, to suppose that the child at birth feels rather pleasure than pain? Nobody has yet supposed that a mother's milk ever excites pain in her infant, which, however, it should do, if every new impression made on it were painful. Would an infant from its birth hunt about for new objects, if the old had given it pain? But it does incessantly hunt after new objects.

But to be, and feel, are two distinct things; and it is not improbable, that Nature may be more intent on the preservation of the infant at its birth, than on its suffering pain, or on its enjoying pleasure.

Another hypothesis, which the Writer would notice, is that of no less celebrated a philosopher than Sir Humphry Davy, respecting the life of plants. This gentleman suggests, that "vegetables may be truly said to be living systems, in this sense, that they possess the means of converting the elements of common matter into organised structures, both by assimilation and reproduction: but we must not suffer ourselves to be (so?) deluded by the very ex-

tensive application of the word life (as?), to conceive in the life of plants any power similar to that producing the life of animals. In calling forth the vegetable functions, common physical agents alone seem to operate; but in the animal system, these agents are made subservient to a superior principle. To give the argument in plainer language, there are few philosophers who would be inclined to assert the existence of any thing above common matter, any thing immaterial in the vegetable economy." Now the Writer differs from Sir Humphry Davy, which, however, he ventures to do with great diffidence, although he is countenanced not only by the few philosophers to whom Sir Humphry Davy alludes, but also by the majority of the vulgar, who, all allow, are not always in the wrong. He acknowledges that there is much mechanical and much chemical agency in a vegetating plant; and he believes that there is much more of both in a healthy animal. But were there no other proof that there is an immaterial principle in plants than the continuation of their species, it alone would convince him that there is such a principle.

Sir H. Davy assumes as data, that the circulation of the blood in animals, depends on the

muscular power of the sides of the vessels, and that this power is limited to beings possessing the means of voluntary locomotion. But neither arteries nor veins are muscular; neither is the circulation of the blood limited to beings possessed of the means of voluntary locomotion. For oysters have a circulation of the blood, and their mere opening during the flux, and shutting during the reflux of the tide, are no more signs of voluntary locomotion, than the mastication and deglutition of a hydrocephalous child, which often last several days after it has ceased to perceive the qualities of external objects. Nay, were the arteries and veins of man muscular, it is not likely that they should be under the controul of his will: if the heart, which is muscular, were under the controul of the will, a man might easily put an end to his existence by a mere volition.

To the argument, that if the capillary vessels of the alburnum had not a vital power, the sap would be retained in them when wounded; Sir H. Davy replies, “ that the sides of all the vessels are soft, and capable of collapsing by gravitation, as veins do in animal systems long after they have lost all their vitality.” But what analogy is there between capillary sap-vessels, and the veins of animals which are not

capillary? When those sap-vessels, which are not capillary, are wounded, they collapse and discharge their contents, as the veins in animal systems do; a circumstance which led Grew and Malpighi, who inspected them when empty, to consider them as tracheae. When an animal is alive, if its capillaries be wounded, their contents flow out; and when a plant is alive, if its sap-vessels be wounded, their contents flow out in the same manner. But if both the animal and the plant be dead, let them be wounded ever so much, the contents of their capillaries do not flow out.

It is laid down by Aristotle, that whatever is endowed with sensation, must have perceptions of pleasure and pain; and, speaking of touch, he says, it is generally diffused through the whole animal frame, and cannot, therefore, be destroyed, without destroying the animal. But the five organs of sense, by which we perceive the qualities of external bodies, are all external; and there is no perception corresponding to any internal sensation. The internal organs assimilate particular substances to themselves, which presupposes indeed a sort of feeling; but this is, perhaps, improperly called a sensation, and still more improperly confounded with that act, through which the perceptions of hardness,

softness, and other qualities of the same kind, are conveyed and communicated. We should not, therefore, suffer ourselves to be deceived by words.

That vegetable life, and animal life in its lowest degree, are in principle one and the same, the Writer is not so incautious as to affirm. The phenomena of hydrocephalus should, however, lead to the supposition, that they are the same. When the signs of animal life have ceased, death soon follows, perhaps because the lowest degree of animal life is not sufficient to preserve animal organization, such is its complexity from dissolution. But if animal substance could, during life, be changed into vegetable, there is no reason to believe that the cessation of respiration, circulation, and locomotion would so soon be followed by death. What changes might take place in an animal converted into a vegetable, it is impossible to say; perhaps such a conversion has not yet been shown in so great a degree, as in the subject of this paper. And as the circumstances that occasioned it are unknown, we should perhaps wait till a similar conversion is observed, and the circumstances of it well ascertained, before we presume to enter into any general speculations respecting it.

The Writer foresees some of the reflections which may arise in a contemplative mind, on hearing not only that fat is difficult of digestion, and that fatness is a state of disease rather than of health, but also that the change in the Strood sheep approximated it to a vegetable; but it is enough to have shown himself aware of such reflections.

Perception then, or rather perceptivity, belongs not to plants; but it belongs not to those animals which were thought to be fossils, before they were believed to be plants; corallines for example, madrepores, millepores, and sponges. Yet these are all susceptible of impressions, and have motions correspondent to them; although all we know of these motions is, that they are sufficient for the preservation of the species. After all, if the reader can admit that nourishment and growth, self-preservation, and the continuance of the species, depend in animals on physical agents subservient to a superior principle; and that the same phenomena depend in plants on physical agents alone; the Reader's and the Writer's logic must be at direct variance and repugnancy with each other. And if it be to suffer a delusion, to believe that plants as well as animals are composed of an organised

body and an immaterial principle, and that the death of both consists in the separation of this principle, the Writer prays that he may continue to suffer it. He is persuaded that it leads to no violation of any law essential to the intercourse of human life, but that it rather incites the adoration of the FIRST CAUSE.

But to return from this digression. It has been stated, that in proportion as the muscles lost their fibrous structure in the Strood sheep, they lost also their capacity of locomotion; so that the sheep became every day weaker, moved more slowly, vacillated more, and fell down oftener. It remains to be remarked, that if its muscles were rendered unfit to assimilate the fibrin of its blood, the removal of them may have depended on a law of Nature; and the substitution of fat for them, is perhaps an instance of another law of Nature; for there is ample testimony, that the place of an eye, of a spleen, of a testis, and of an ovarium, has been supplied by fat. Will any person object that, although the cause of the change is referred to the muscles of the sheep, the nature of the change is not described? It is philosophical to trace known effects to unknown causes; and, when this is done, it is philosophical to de-

sist. The veil that conceals efficient or metaphysical causes, is not to be drawn aside by unhallowed hands.

To conclude. The Writer is not altogether free from apprehension, that he may be censured for having touched on such a variety of subjects, some of which, although they are all naturally allied, can scarcely be considered as being closely connected with his principal object. He confesses his crime, of which a proper deference to the Public might, some may say, have prevented him from being guilty. He was not without a proper deference to the Public. But as he never intended to compose a regular treatise; as his thoughts, however desultory, could give no offence, and much less provoke resentment; as to cast his materials in a new mould, would have taken up too much of his time; for these and various other reasons, he resolved to submit what he had written, in the very disorder in which it was written, to the judgment of the intelligent and ingenuous; and not to deprecate their censure, lest he should betray distrust, and so be frustrated of the hope he entertained. He who is not limited to a single province, may travel over a vast empire, and mark in his way the errors of philosophers and the prejudices of the vulgar. He may do more;

he may rest longest, where there is most to call forth the benevolent affections, and may every where find solace in the devout admiration of that infinitely various and awfully wonderful adaptation of means to ends, which is a proof beyond dispute, that the Deity governs by his providence, and judges by his righteousness, the world created by his wisdom and power.

FINIS.

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